Available online at www.sciencedirect.com
SCIENCE DIRECT®
ELSEVIER
Nuclear Instruments and Methods in Physics Research B 241 (2005) xxi–xxxi
NIM B
Beam Interactions with Materials & Atoms
www.elsevier.com/locate/nimb

Contents

Editorial vii
Obituary: Ira Lon Morgan x
Dedication: Joseph H. Macek xii
Dedication: Janet M. Sisterson xiv
Dedication: J.L. (Iain) Campbell xvi
Committees and Sponsors xviii

Basic Science with Accelerators

Atomic Physics

Hyperspherical adiabatic potentials for 3-fermion threshold interactions
J.H. Macek and J. Sternberg 1
Challenges and opportunities for atomic physics at FAIR: The new GSI accelerator project
S. Hagmann, H.F. Beyer, F. Bosch, A. Bräuning-Demian, H.-J. Kluge, Ch. Kozhuharov, Th. Kühl, D. Liesen, Th. Stöhlker, J. Ullrich, R. Moshammer, R. Mann, P. Mokler, W. Quint, R. Schuch and A. Warczak 5
Motivation and development of ultrafast laser-based accelerator techniques for chemical physics research
R.A. Crowell, I.A. Shkrob, D.A. Oulianov, O. Korovyanko, D.J. Gosztola, Y. Li and R. Rey-de-Castro 9
Review of bremsstrahlung experiments with free gas atom targets
C.A. Quarles and S. Portillo 14
Doubly and triply differential ionization studies using positrons and electrons
R.D. DuBois, A.C.S. Santos, M.A. Thomason and J. Gavin 19
EUV emission from xenon in the 10–80 nm wavelength range using a compact ECR ion source
H. Merabet, S. Kondagari, R. Bruch, S. Fülling, S. Hahto, K.-L. Leung, J. Reijonen, A.L. Godunov and V.A. Schipakov 23
Comparison of asymptotic forms of the wave function for double ionization
J. Martinez 30
Testing the ECPSSR theory and its modifications with ratios of antiproton-to-proton ionization cross sections
G. Lapicki 34
On the effect of image states on resonant neutralization of hydrogen anions near metal surfaces
H.S. Chakraborty, T. Niederhausen and U. Thumm 43
Classical and quantal methods in atomic and molecular collisions
A. Dubois, J. Caillat, J.P. Hansen, I. Sundvor, F. Frémont, P. Sobocinski, J.-Y. Chesnel, R. Gayet, J. Fu, M.J. Fitzpatrick, W.F. Smith and J.F. Reading 48

doi:10.1016/S0168-583X(05)01863-X

A critique of finite Hilbert basis set calculations for the angular distribution of ionized electrons produced in $p + H$ impact at 20 keV
J.F. Reading, J. Fu and M.J. Fitzpatrick 54
Vibrationally resolved collisions in cold hydrogen plasma
P.S. Krstić 58
L x-ray production in $_{57}$La, $_{58}$Ce, $_{60}$Nd and $_{62}$Sm by 35–60 MeV carbon and oxygen ions
R. Mehta, N.K. Puri, A. Kumar, A. Kumar, B.P. Mohanty, P. Balouria, I.M. Govil, M.L. Garg, T. Nandi, A. Ahamad and G. Lapicki 63
A molecular-scale photocathode – using a molecule's own electrons to image itself
D.M. Villeneuve, H. Niikura, N. Milosevic, T. Brabec and P.B. Corkum 69
Single and double ionization of helium by the impact of fast charged particles
S. Jones, D.H. Madison and J.H. Macek 73
Sturmian theory of electron energy distributions in low energy ion–atom collisions
S.Yu. Ovchinnikov and J.H. Macek 78
Femtosecond Thomson scattering X-ray source based on laser wakefield accelerator for ultrafast X-ray absorption spectroscopy
D.A. Oulianov, R.A. Crowell, D.J. Gosztola and Y. Li 82
Electron loss in MeV/u collisions between many-electron projectiles and targets
R.D. DuBois 87
K-shell X-ray production of In and Sn by proton, helium, and lithium ions
Y.C. Yu, J.Y. Hsu and K.M. Chen 90
Measurements and calculations of M-shell X-ray production in Er, Yb and Lu by 0.75–6 MeV He ions
F. Naab, J.L. Duggan, O.W. Holland, F.D. McDaniel and G. Lapicki 94
One- and two-electron processes in collisions between hydrogen molecules and slow highly charged ions
E. Wells, K.D. Carnes, H. Tawara, R. Ali, E.Y. Sidky, C. Illescas and I. Ben-Itzhak 101
State-selective single-electron capture by Ar^{4+} and Ar^{5+} ions from N_2, O_2 and CF_4 molecules
O. Abu-Haija, S.A. Al-Faify, G. Olmez, S.M. Ferguson and E.Y. Kamber 109
Double photoionization near threshold
J.B. Bluett, D. Lukic, S.B. Whitfield and R. Wehlitz 114
Laser photodetachment electron spectroscopy studies of heavy atomic anions
V.T. Davis, J. Thompson and A. Covington 118
Photon emission resulting from collisions of O^{5+} with CO
T. Ehrenreich, K. Miller, P. Gee, Q. Kessel, E. Pollack, W.W. Smith, N. Djuric, J. Lozano, S.J. Smith and A. Chutjian 125
Relative intensities of L X-rays excited by 75–300 keV proton impact on elements with Z = 39–50
S.J. Cipolla and B.P. Hill 129
Relative state selective capture cross sections for low energy collisions between highly charged bare ions and neutral atoms
J.A. Perez and R.E. Olson 134

Beam Interactions with Matter

Relativistic atomic sum rules
S.M. Cohen 139
Comparison of shell corrections in the Bohr and Bethe formulations of stopping power
J. Oddershede, J.R. Sabin and R. Cabrera-Trujillo 144
Learning ion–solid interactions hands-on: An activity based, inquiry oriented, graduate course
G. Braunstein 150
Experimental stopping forces in aluminum and silver by ^{3}He/^{4}He, ^{6}Li/^{7}Li and ^{10}B/^{11}B ions
J.Y. Hsu, Y.C. Yu, J.H. Liang and K.M. Chen 155
Energy straggling of He, Li, and B isotopes in aluminium and silver
J.Y. Hsu, J.H. Liang, Y.C. Yu and K.M. Chen 160

Quasi-bound states of antihydrogen
C.E. Correa, S.A. Khan, J.R. Correa and C.A. Ordonez 165

Nuclear Physics

The high intensity γ-ray source (HIγS) and recent results
A.P. Tonchev, M. Boswell, C.R. Howell, H.J. Karwowski, J.H. Kelley, W. Tornow and Y.K. Wu 170
(n, γ) measurements on radioactive isotopes with DANCE
R. Reifarth, E.-I. Esch, A. Alpizar-Vicente, E.M. Bond, T.A. Bredeweg, S.E. Glover, U. Greife, R. Hatarik, R.C. Haight, A. Kronenberg, J.M. O'Donnell, R.S. Rundberg, J.M. Schwantes, J.L. Ullmann, D.J. Vieira, J.B. Wilhelmy and J.M. Wouters 176
Investigation of the radiative strength function
U. Agvaanluvsan, E. Algin, J.A. Becker, M. Guttormsen, G.E. Mitchell, S. Siem, A. Schiller and A. Voinov 180
Nuclear structure studies at the proton drip line via proton radioactivity studies
C.R. Bingham, M.N. Tantawy, J.C. Batchelder, M. Danchev, T.N. Ginter, C.J. Gross, D.J. Fong, R. Grzywacz, K. Hagino, J.H. Hamilton, M. Karny, W. Królas, C. Mazzocchi, A. Piechaczek, A.V. Ramayya, K. Rykaczewski, A. Stolz, J.A. Winger, C.-H. Yu and E.F. Zganjar 185
Direct nn-scattering at the YAGUAR reactor
B.E. Crawford, W.I. Furman, C.R. Howell, E.V. Lychagin, B.G. Levakov, V.I. Litvin, A.E. Lyzhin, E.P. Magda, G.E. Mitchell, A.Yu. Muzichka, G.V. Nekhaev, E.I. Sharapov, V.N. Shvetsov, S.L. Stephenson, A.V. Strelkov and W. Tornow 190
Beta-decay studies of neutron-rich nuclei produced using projectile fragmentation at the NSCL
P.F. Mantica, S.N. Liddick and B.E. Tomlin 195
Neutron transfer reactions with neutron-rich radioactive ion beams
J.A. Cizewski, K.L. Jones, S.D. Pain, J.S. Thomas, C. Baktash, D.W. Bardayan, J.C. Blackmon, C. Gross, J.F. Liang, D. Shapira, M.S. Smith, R.L. Kozub, B.H. Moazen, C.D. Nesaraja, H.K. Carter, M.S. Johnson, R.P. Fitzgerald, D.W. Visser, U. Greife, R.J. Livesay, W. Catford and Z. Ma 200
Indirect techniques in nuclear astrophysics: The ANC method
R.E. Tribble 204

Positron, Neutron and Photon Experiments

Status of the low energy neutron source at Indiana University
D.V. Baxter, J.M. Cameron, V.P. Derenchuk, C.M. Lavelle, M.B. Leuschner, M.A. Lone, H.O. Meyer, T. Rinckel and W.M. Snow 209
The fundamental neutron physics facilities at NIST
M.S. Dewey, M. Arif, T.R. Gentile, D.M. Gilliam, D.L. Jacobson, J.S. Nico and A.K. Thompson. . . . 213
New neutron cross-section measurements at ORELA and their application in nuclear criticality calculations
K.H. Guber, L.C. Leal, R.O. Sayer, P.E. Koehler, T.E. Valentine, H. Derrien and J.A. Harvey 218
Compton suppression for neutron activation analysis applications at the National Institute of Standards and Technology (NIST)
T. Stover and G. Lamaze 223
The A-711 high yield neutron generator and automated pneumatic transfer system for fast neutron activation analysis
J.D. Simpson, D.L. Chichester and J.R. Hill 228
Pulsed neutron generator system for astrobiological and geochemical exploration of planetary bodies
H. Akkurt, J.L. Groves, J. Trombka, R. Starr, L. Evans, S. Floyd, R. Hoover, L. Lim, T. McClanahan, R. James, T. McCoy and J. Schweitzer 232
High-brightness hard X-ray scanning nano-probes at NSLS II
J.M. Ablett 238

Synchrotron radiation in biosciences
N.S. Marinkovic, S. Gupta, C. Zhan and M.R. Chance 242
Applications of synchrotron X-rays in microelectronics industry research
J.L. Jordan-Sweet, C. Detavernier, C. Lavoie, P.M. Mooney and M.F. Toney 247
Investigation of shock wave effects on positron annihilation in copper and tungsten
F.A. Selim, J. Williams, D.P. Wells and J.F. Harmon 253
Positronium formation cross section for positron–lithium collisions
S.J. Ward and J. Shertzer 257
Defect imaging of structural objects using positron annihilation spectroscopy
A.W. Hunt, R. Spaulding, J. Urban-Klaehn, J.F. Harmon and D.P. Wells 262
Studies of positron trapping at quantum-dot-like particles on metal surfaces
N.G. Fazleev 267
Review of positron annihilation spectroscopy studies of rubber with carbon black filler
J. Wang, J. Vincent and C.A. Quarles 271
Ultra-fast flash X-ray pulses produced by Blumlein devices
F. Davanloo, C.B. Collins and F.J. Agee 276

High Energy Physics

RHIC performance and future plans
W. Fischer 281
Super neutrino project: Design and development
D. Raparia 286
The detector upgrade program of the STAR experiment at RHIC at BNL
B. Surrow, On behalf of the STAR collaboration 293
Barrel silicon vertex tracker for PHENIX at RHIC
H. Ohnishi, for PHENIX Collaboration 297
The PHENIX forward detector upgrade
J.C. Hill, for the PHENIX collaboration 301
The large-area time-of-flight upgrade for STAR
W.J. Llope, for the STAR TOF Group 306
A new comprehensive detector for RHIC-II
H. Caines 311

Applications of Accelerators

Materials Analysis with Ion Beams

Beyond single scattering off flat samples
N.P. Barradas, A. Fonseca, N. Franco and E. Alves 316
Using accelerator techniques to verify details in SIMS profiles
S.W. Novak, C.W. Magee and T. Büyüklimanli 321
Ion beam analysis of GaInAsSb films grown by MOVPE on GaSb
V. Corregidor, N.P. Barradas, E. Alves, N. Franco, L.C. Alves, P.C. Chaves and M.A. Reis 326
Synchrotron X-ray microprobe and computed microtomography for characterization of nanocatalysts
K.W. Jones, H. Feng, A. Lanzirotti and D. Mahajan 331
Development of focused ion beam systems with various ion species
Q. Ji, K.-N. Leung, T.-J. King, X. Jiang and B.R. Appleton 335
Damage annealing process in implanted poly-silicon studied by nanocalorimetry: Effects of heating rate and beam flux
R. Karmouch, J.-F. Mercure, Y. Anahory and F. Schiettekatte 341

Field emitter arrays and displays produced by ion tracking lithography
T.E. Felter, R.G. Musket and A.F. Bernhardt 346
Distribution of heavy metals in plants cultivated with wastewater irrigated soils during different periods of time
C. Solís, E. Andrade, A. Mireles, I.E. Reyes-Solís, N. García-Calderón, M.C. Lagunas-Solar, C.U. Piña and R.G. Flocchini 351
Laser post-ionization secondary neutral mass spectrometry for ultra-trace analysis of samples from space return missions
I.V. Veryovkin, W.F. Calaway, C. Emil Tripa, J.F. Moore, A. Wucher and M.J. Pellin 356
Analysis of nanolayered samples with a ^{4}He beam
N. Franco, J.A.A. Gouveia, E. Alves, S. Cardoso, P.P. Freitas and N.P. Barradas 361
Ion beam implantation and cross-sectional TEM studies of lanthanide titanate pyrochlore single crystals
J. Lian, L.M. Wang, R.C. Ewing and L.A. Boatner 365
Accumulation and recovery of disorder in Au^{2+}-irradiated $Cd_2Nb_2O_7$
W. Jiang, W.J. Weber and L.A. Boatner 372
Ion backscattering study of ultra-thin oxides: Al_2O_3 and $AlHfO_x$ films on Si
L.S. Wielunski, Y. Chabal, M. Paunescu, M.-T. Ho, R. Brewer and J.E. Reyes 377
Upgrading a Duoplasmatron ion source to produce high brightness beam for nuclear microprobe applications with a tandem accelerator
B. Rout, R. Greco, N. Pastore, A.D. Dymnikov and G.A. Glass 382
Phase-based cell imaging techniques for microbeam irradiations
G.J. Ross, A.W. Bigelow, G. Randers–Pehrson, C.C. Peng and D.J. Brenner 387
A microbeam irradiator without an accelerator
G. Garty, G.J. Ross, A. Bigelow, G. Randers-Pehrson and D.J. Brenner 392
High energy focused ion beam lithography using P-beam writing
G.A. Glass, B. Rout, A.D. Dymnikov, R.R. Greco, M. Kamal, J.R. Reinhardt and J.A. Peeples 397
Zoom quadrupole focusing systems producing an image of an object
A.D. Dymnikov, G.A. Glass and B. Rout 402
The Berkeley Accelerator Space Effects (BASE) Facility – A new mission for the 88-Inch Cyclotron at LBNL
M.A. McMahan 409
Using the LANSCE irradiation facility to predict the number of fatal soft errors in one of the world's fastest supercomputers
S.E. Michalak, K.W. Harris, N.W. Hengartner, B.E. Takala and S.A. Wender 414
The Uppsala neutron beam facility for electronics testing
M. Österlund, J. Blomgren, S. Pomp, A.V. Prokofiev, U. Tippawan, L.-O. Andersson, T. Bergmark, O. Byström, H. Calén, L. Einarsson, C. Ekström, J. Fransson, K. Gajewski, N. Haag, T. Hartman, E. Hellbeck, T. Johansen, O. Jonsson, B. Lundström, L. Pettersson, D. Reistad, P.-U. Renberg, D. Wessman and V. Ziemann 419
ERDA with 15 MeV ^{4}He ions under atmospheric pressure
R. Ishigami, Y. Ito, K. Yasuda and S. Hatori 423
ERDA at the low energy limit
M. Döbeli, C. Kottler, F. Glaus and M. Suter 428
Improvement in the low energy collection efficiency of Si(Li) X-ray detectors
C.E. Cox, D.A. Fischer, W.G. Schwarz and Y. Song 436
Nanoscale studies of cement chemistry with ^{15}N resonance reaction analysis
J.S. Schweitzer, R.A. Livingston, C. Rolfs, H.-W. Becker, S. Kubsky, T. Spillane, M. Castellote and P.G. de Viedma 441
Transmission ion chamber: Design and application
B. Shumard, T. Pennington, D.J. Henderson, D. Seweryniak, K.E. Rehm, C.L. Jiang, C.N. Davids, C.J. Lister, B.J. Zabransky and B. Blank 446
RBS characterization of Al_2O_3 films doped with Ce and Mn
R. Martínez-Martínez, J. Rickards, M. García-Hipólito, R. Trejo-Luna, E. Martínez-Sánchez, O. Álvarez-Fregoso, F. Ramos-Brito and C. Falcony 450

High resolution backscattering studies of nanostructured magnetic and semiconducting materials
A. Fonseca, N. Franco, E. Alves, N.P. Barradas, J.P. Leitão, N.A. Sobolev, D.F. Banhart, H. Presting, V.V. Ulyanov and A.I. Nikiforov 454
Absolute differential and total cross sections for N^+ formation from the interaction of N_2^+ with He and Ar
H. Martínez and B.E. Fuentes 459
RBS characterization of uranium in flint and chert
S. Matteson, M.J. Avara, C.V. Nguyen and S.H. Kim 465
Ion-channeling studies of InAs/GaAs quantum dots
H. Niu, C.H. Chen, H.Y. Wang, S.C. Wu and C.P. Lee 470
Investigations of thick metal oxide films on steel surface using proton non-Rutherford backscattering technique
A.F. Gurbich 475
3D micromachining of SU-8 polymer with proton microbeam
J. Simčič, P. Pelicon, Z. Rupnik, M. Mihelič, A. Razpet, D. Jenko and M. Maček 479
Measurement of the molar fraction of ^{13}C in diamond films using Raman and Rutherford scattering – an undergraduate student laboratory experience
D.M. Walters Jr., W.S. Hooker Jr., E.W. Shroyer, P.A. Baker, Y.K. Vohra and R.S. Peterson 486

Ion Implementation and Materials Modification

Helium retention and surface blistering characteristics of tungsten with regard to first wall conditions in an inertial fusion energy reactor
S.B. Gilliam, S.M. Gidcumb, D. Forsythe, N.R. Parikh, J.D. Hunn, L.L. Snead and G.P. Lamaze 491
Computer simulation of surface modification with ion beams
Z. Insepov, A. Hassanein, D. Swenson and M. Terasawa 496
Atomistic modeling of ion beam induced amorphization in silicon
L. Pelaz, L.A. Marqués, P. López, I. Santos, M. Aboy and J. Barbolla 501
Ion beam assisted formation of nanolayers
R.L. Zimmerman, D. Ila, C. Muntele and I. Muntele 506
Select gas absorption in carbon nanotubes loading a resonant cavity to sense airborne toxin gases
A. Anand, J.A. Roberts, F. Naab, J.N. Dahiya, O.W. Holland and F.D. McDaniel 511
ETFE polymer bombarded with 1 MeV proton
M.A. Parada, A. de Almeida, I. Muntele, C. Muntele, N. Delalez and D. Ila 517
Study of the surface activation of ETFE by low energy (keV) Si and N bombardment
M.A. Parada, A. de Almeida, C. Muntele, I. Muntele, N. Delalez and D. Ila 521
Positron annihilation investigation and nuclear reaction analysis of helium and oxygen-implanted zirconia
R.I. Grynszpan, S. Saudé, W. Anwand and G. Brauer 526
Thick Si-on-insulator wafers formation by ion-cut process
H.J. Woo, H.W. Choi, J.K. Kim, G.D. Kim, W. Hong, W.B. Choi and Y.H. Bae 531
Radiation effects on yttria-stabilized zirconia irradiated with He or Xe ions at high temperature
T. Hojo, H. Yamamoto, J. Aihara, S. Furuno, K. Sawa, T. Sakuma and K. Hojou 536
An investigation of annealing effect on forming nickel disilicide by ion beam synthesis
J.Y. Hsu and J.H. Liang 543
Formation of optically-active, metal silicides using ion implantation and/or oxidation
L.J. Mitchell, O.W. Holland, K. Hossain, E.B. Smith, T.D. Golden, J.L. Duggan and F.D. McDaniel . 548
Rate enhancement during thermal oxidation of Ge^+-implanted silicon
K. Hossain, L.K. Savage and O.W. Holland 553
Recrystallization behavior in SiC amorphized with He or Ne irradiation
J. Aihara, T. Hojo, S. Furuno, M. Ishihara, K. Sawa, H. Yamamoto and K. Hojou 559
The effects of thermal quenching on ion-beam-induced phase transformation detection by ion-beam-induced luminescence
G.E. Gosnell, C.J. Wetteland, J.R. Tesmer, M.G. Hollander, D.W. Cooke, I.V. Afanasyev and K.E. Sickafus 563

MeV Si ion bombardments of thermoelectric Bi_xTe_3/Sb_2Te_3 multilayer thin films for reducing thermal conductivity
Z. Xiao, R.L. Zimmerman, L.R. Holland, B. Zheng, C.I. Muntele and D. Ila 568
Effects of thermally-activated diffusion on 72 keV Ni ion implantation into Cu targets at elevated temperatures
W.F. Tsai, J.H. Liang and J.J. Kai 573
Effects of proton irradiation on triboluminescent materials such as ZnS:Mn
W.A. Hollerman, S.M. Goedeke, N.P. Bergeron, C.I. Muntele, S.W. Allison and D. Ila 578
Ion-irradiation induced chemical ordering of FePt and FePtAu nanoparticles
N.V. Seetala, J.W. Harrell, J. Lawson, D.E. Nikles, J.R. Williams and T. Isaacs-Smith 583

Cluster Ions and Applications

Recent advances in R&D of gas cluster ion beam processes and equipment
I. Yamada and N. Toyoda 589
Molecular dynamics study of the angular dependence of reactive cluster impacts
T. Aoki and J. Matsuo 594
Analysis of charge, mass and energy of large gas cluster ions and applications for surface processing
D.R. Swenson 599
Energy distributions of high current cluster ion beams
T. Seki and J. Matsuo 604
Development of a size-selected gas cluster ion beam system for low-damage processing
N. Toyoda, S. Houzumi and I. Yamada 609
Development of a new cluster size selector
K. Ohwaki, Y. Dake, N. Toyoda and I. Yamada 614
Irradiation of silicon surface by Ar cluster ion beam: Cluster size effects
Y. Nakayama, S. Houzumi, N. Toyoda, K. Mochji, T. Mitamura and I. Yamada 618
Sidewall polishing with a gas cluster ion beam for photonic device applications
E. Bourelle, A. Suzuki, A. Sato, T. Seki and J. Matsuo 622
Development of pure O_2 cluster ion beam assisted deposition system
T. Nose, S. Inoue, N. Toyoda, K. Mochiji, T. Mitamura and I. Yamada 626
Smoothing of ZnO films by gas cluster ion beam
H. Chen, S.W. Liu, X.M. Wang, M.N. Iliev, C.L. Chen, X.K. Yu, J.R. Liu, K. Ma and W.K. Chu ... 630
Small B-cluster ions induced damage in silicon
J. Liu, X. Wang, S. Lin, H. Chen and W.-K. Chu 636
Smoothing RF cavities with gas cluster ions to mitigate high voltage breakdown
D.R. Swenson, E. Degenkolb, Z. Insepov, L. Laurent and G. Scheitrum 641

Medical Isotopes, Diagnostics and Therapy

A quality system for PET: An industry perspective
S.S. Zigler, K. Breslow and M. Nazerias 645
Cyclotron production of cesium radionuclides as analogues for francium-221 biodistribution
R. Finn, M. McDevitt, Y. Sheh, C. Lom, J. Qiao, S. Cai, E. Burnazi, A. Nacca, N. Pillarsetty, J. Jaggi and D. Scheinberg 649
Production of stable isotopes utilizing the plasma separation process
T.S. Bigelow, F.J. Tarallo and N.R. Stevenson 652
Beamline developments in commercial cyclotron facilities
M.P. Dehnel, A. Trudel, T.S. Duh and T. Stewart 655
An automated system for oxygen-18 water recovery and fluorine-18 delivery
M.J. Schueller, R.A. Ferrieri and D.J. Schlyer 660

Engineering refinements to overcome default nuclide regulatory constraints
R. Finn, P. Capitelli, Y. Sheh, C. Lom, M. Graham and J.St. Germain 665
Radioisotope production targets and modules
R.R. Johnson, K. Erdman, W. Gyles, J. Burbee, A. Manegoda, V. Sabaiduc, B. Kovac, E. VanLier, J. Wong, R. Watt, J. Wilson and A. Zyuzin 670
Radiolabeled probes for imaging Alzheimer's plaques
P.V. Kulkarni, V. Arora, A.C. Roney, C. White III, M. Bennett, P.P. Antich and F.J. Bonte. 676
Distribution of lead in the brain tissues from DNTC patients using synchrotron radiation microbeams
A. Ide-Ektessabi, Y. Ota, R. Ishihara, Y. Mizuno and T. Takeuchi 681
RBS and XPS analyses of the composite calcium phosphate coatings for biomedical applications
A. Ide-Ektessabi, T. Yamaguchi and Y. Tanaka 685
Radiolabeled *Escherichia coli* heat-stable enterotoxin analogs for in vivo imaging of colorectal cancer
M.F. Giblin, G.L. Sieckman, N.K. Owen, T.J. Hoffman, L.R. Forte and W.A. Volkert 689
Radiohalogen targetry at the University of Wisconsin
J.A. Nye, D.W. Dick, M.A. Avila-Rodriguez and R.J. Nickles 693
Beam optics of the 2 MeV proton injection line at the LLUMC proton accelerator
G. Coutrakon, J. Hubbard and E. Sanders. 697
Emittance measurements from the LLUMC proton accelerator
G. Coutrakon, G.H. Gillespie, J. Hubbard and E. Sanders 702
Design, test and widespread implementation of a compact kilo-Watt fluoride ion target
C.W. Alvord, A.C. Williamson, T.L. Graves and S.S. Zigler 708
Ion beam therapy in 2004
J. Sisterson 713
Experience with carbon ion radiotherapy at GSI
O. Jäkel, D. Schulz-Ertner, C.P. Karger, P. Heeg and J. Debus 717
New superconducting cyclotron driven scanning proton therapy systems
H.-U. Klein, C. Baumgarten, A. Geisler, J. Heese, A. Hobl, D. Krischel, M. Schillo, S. Schmidt and J. Timmer 721
Preliminary report on the development of a high resolution PET camera using semiconductor detectors
Y. Kikuchi, K. Ishii, H. Yamazaki, S. Matsuyama, T. Yamaguchi, Y. Yamamoto, T. Sato, Y. Aoki and K. Aoki 727
Double-grid [^{18}O]water target for high yield of [^{18}F]fluoride production on KIRMAS-13
B.H. Hong, D.H. An, J.S. Chai, H.S. Chang, M.G. Hur, I.S. Jung, S. Kim, Y.S. Kim and T.K. Yang . 732
The study of proton beam irradiated $H_2{}^{18}O$ water target
M.-G. Hur, I.-S. Jung, H.-S. Chang, S.-D. Yang, J.-S. Chai and H.-S. Oh 735

Homeland Security

Idaho Explosives Detection System
E.L. Reber, L.G. Blackwood, A.J. Edwards, J.K. Jewell, K.W. Rohde, E.H. Seabury and J.B. Klinger . 738
Tagged neutron inspection system (TNIS) based on portable sealed generators
S. Pesente, G. Nebbia, M. Lunardon, G. Viesti, S. Blagus, K. Nad, D. Sudac, V. Valkovic, I. Lefesvre and M.J. Lopez-Jimenez 743
Detection of hidden explosives by using tagged neutron beams: Status and perspectives
G. Viesti, S. Pesente, G. Nebbia, M. Lunardon, D. Sudac, K. Nad, S. Blagus and V. Valković 748
The API 120: A portable neutron generator for the associated particle technique
D.L. Chichester, M. Lemchak and J.D. Simpson 753
Dynamics of soil parameters relevant for humanitarian demining
J. Obhođaš, N. Vdović and V. Valković. 759

Cement analysis using d + D neutrons
P.C. Womble, J. Paschal and R. Moore 765
Photonuclear-based, nuclear material detection system for cargo containers
J.L. Jones, W.Y. Yoon, D.R. Norman, K.J. Haskell, J.M. Zabriskie, S.M. Watson and J.W. Sterbentz 770
Preliminary results utilizing high-energy fission product γ-rays to detect fissionable material in cargo
D.R. Slaughter, M.R. Accatino, A. Bernstein, J.A. Church, M.A. Descalle, T.B. Gosnell, J.M. Hall, A. Loshak, D.R. Manatt, G.J. Mauger, T.L. Moore, E.B. Norman, B.A. Pohl, J.A. Pruet, D.C. Petersen, R.S. Walling, D.L. Weirup, S.G. Prussin and M. McDowell 777
Nuclear materials detection using high-energy γ-rays
B.J. Micklich and D.L. Smith 782
Inspection applications with higher electron beam energies
D.R. Norman, J.L. Jones, W.Y. Yoon, K.J. Haskell, J.W. Sterbentz, J.M. Zabriskie, A.W. Hunt, F. Harmon and M.T. Kinlaw 787
Portable active interrogation system
C.E. Moss, M.W. Brener, C.L. Hollas and W.L. Myers 793
Inspections for contraband in a shipping container using fast neutrons and the associated alpha particle technique: Proof of principle
D. Sudac, S. Blagus and V. Valkovic 798
Fast coincidence counting with active inspection systems
J.A. Mullens, J.S. Neal, P.A. Hausladen, S.A. Pozzi and J.T. Mihalczo 804
Understanding X-ray cargo imaging
G. Chen 810
Portable generator-based XRF instrument for non-destructive analysis at crime scenes
J.S. Schweitzer, J.I. Trombka, S. Floyd, C. Selavka, G. Zeosky, N. Gahn, T. McClanahan and T. Burbine 816
Nuclear resonance fluorescence imaging in non-intrusive cargo inspection
W. Bertozzi and R.J. Ledoux 820
A kinematically beamed, low energy pulsed neutron source for active interrogation
D. Dietrich, C. Hagmann, P. Kerr, L. Nakae, M. Rowland, N. Snyderman, W. Stoeffl and R. Hamm 826
MCNP calculations for container inspection with tagged neutrons
G. Boghen, A. Donzella, V. Filippini, A. Fontana, M. Lunardon, S. Moretto, S. Pesente and A. Zenoni 831
An alpha particle detector for a portable neutron generator for the Nuclear Materials Identification System (NMIS)
P.A. Hausladen, J.S. Neal and J.T. Mihalczo 835

Radiation Processing

Dynamitron control systems
T.F. Lisanti 839
Modular low-voltage electron emitters
A.J. Berejka 844
X-ray curing of composite materials
A.J. Berejka, M.R. Cleland, R.A. Galloway and O. Gregoire 847
Energy determination in industrial X-ray processing facilities
M.R. Cleland, O. Gregoire, F. Stichelbaut, I. Gomola, R.A. Galloway and J. Schlecht 850
Non-vacuum electron beam welding through a plasma window
A. Hershcovitch 854

Technology for Accelerators

Source and Accelerator Technology

Production of rare isotope beams with the NSCL fragment separator
A. Stolz, T. Baumann, T.N. Ginter, D.J. Morrissey, M. Portillo, B.M. Sherrill, M. Steiner and J.W. Stetson 858
Developments and applications of accelerator system at the Wakasa Wan Energy Research Center
S. Hatori, T. Kurita, Y. Hayashi, M. Yamada, H. Yamada, J. Mori, H. Hamachi, S. Kimura, T. Shimoda, M. Hiroto, T. Hashimoto, M. Shimada, H. Yamamoto, N. Ohtani, K. Yasuda, R. Ishigami, M. Sasase, Y. Ito, M. Hatashita, K. Takagi, K. Kume, S. Fukuda, N. Yokohama, G. Kagiya, S. Fukumoto and M. Kondo 862
The next generation refrigerated (cryogenic) electron beam ion trap-source (REBIT-S)
J.W. McDonald and D.H.G. Schneider 870
Laser ion source for Columbia University's microbeam
A.W. Bigelow, G. Randers-Pehrson, R.P. Kelly and D.J. Brenner 874
New accelerators for femtosecond beam pump-and-probe analysis
M. Uesaka, A. Sakumi, T. Hosokai, K. Kinoshita, N. Yamaoka, A. Zhidkov, T. Ohkubo, T. Ueda, Y. Muroya, Y. Katsumura, H. Iijima, H. Tomizawa and N. Kumagai 880
Extraction of SiN^- ions from source of negative ions by cesium sputtering
X.M. Wang, J.R. Liu, L. Shao, K.B. Ma, H. Chen, X.K. Yu and W.K. Chu 885
A LabVIEW-based expandable modular control system with a layered structure for a 3 MV tandem accelerator
W. Xu and F.D. McDaniel 890
An ion source upgrade for an axial injection based commercial cyclotron
M.P. Dehnel, T. Stewart, M. Roeder and K. Le Du 896
Development of spatial filter for laser plasma cathode
N. Yamaoka, T. Ohkubo, T. Hosokai, K. Kinoshita, K. Nakamura and M. Uesaka 901
Laser pulse circulation system for a compact monochromatic hard X-ray source
F. Ebina, A. Fukasawa, F. Sakamoto, H. Ogino, M. Uesaka and K. Dobashi 905
Transverse confinement of an ion beam in a purely electrostatic configuration
J.R. Correa, C.A. Ordonez and D.L. Weathers 909
Generation of focused electron beam and X-rays by the doped $LiNbO_3$ crystals
M. Bayssie, J.D. Brownridge, N. Kukhtarev, T. Kukhtarev and J.C. Wang 913
Development of D–D neutron generator
I.J. Kim and H.D. Choi 917
A tunable monochromatic hard X-ray CT composed of an X-band linear accelerator and a Q-switched laser
A. Fukasawa, M. Uesaka, F. Sakamoto, F. Ebina, K. Dobashi, J. Urakawa, M. Akemoto, T. Higo and H. Hayano 921

Radioactive Beams

Upgrade status and plans at the Holifield Radioactive Ion Beam Facility
B.A. Tatum 926
GRETINA status and recent progress: The effect of neutron damage on energy and position resolution of the GRETINA detector
M. Descovich, I.Y. Lee, M. Cromaz, R.M. Clark, M.A. Deleplanque, R.M. Diamond, P. Fallon, A.O. Macchiavelli, E. Rodriguez-Vieitez, F.S. Stephens and D. Ward 931
Developments in ECRISs for RIKEN RI beam factory project
T. Nakagawa and Y. Yano 935

Recent developments in the target-and-ion-source station for the SPIRAL II project at GANIL
P. Jardin, C. Barué, C. Canet, J. Cornell, M. Dubois, M. Dupuis, J.-L. Flambard, G. Gaubert, C. Huet-Equilbec, N. Lecesne, P. Lehérissier, F. Lemagnen, R. Leroy, J.Y. Pacquet, L. Penescu, M.G. Saint Laurent, O. Tuske and A.C.C. Villari 940
Monte-Carlo simulation of complex vapor-transport systems for RIB applications
Y. Zhang and G.D. Alton 947
Production of light radioactive ion beams (RIB) using inverse kinematics
J.J. Das, P. Sugathan, N. Madhavan, P.V. Madhusudhana Rao, A. Jhingan, T. Varughese, S. Barua, S. Nath, A.K. Sinha, B. Kumar and J. Zacharias 953
Design of SuSI – superconducting source for ions at NSCL/MSU – II. The conventional parts
P.A. Zavodszky, B. Arend, D. Cole, J. DeKamp, G. Machicoane, F. Marti, P. Miller, J. Moskalik, J. Ottarson, J. Vincent and A. Zeller 959
Performance characterization studies of a flat field volume ECR ion source
Y. Liu, H. Bilheux, Y. Kawai, F.W. Meyer and G.D. Alton 965
g-Factor measurements of first 2^+ states of heavy Te isotopes based on nuclear spin deorientation for nuclei recoiling in vacuum
M. Danchev, J. Pavan, N.J. Stone, A.E. Stuchbery, C. Baktash, J. Beene, N. Benczer-Koller, C.R. Bingham, J. Dupak, A. Galindo-Uribarri, C.J. Gross, G. Kumbartzki, D.C. Radford, J.R. Stone, C.L. Timlin, C.-H. Yu and N.V. Zamfir 971
Isobaric analog states as a tool for spectroscopy of exotic nuclei
G.V. Rogachev, A.A. Aprahamian, F.D. Becchetti, P. Boutachkov, Y. Chen, G. Chubarian, P.A. DeYoung, A. Fomichev, V.Z. Goldberg, M.S. Golovkov, J.J. Kolata, Yu.Ts. Oganessian, G.F. Peaslee, M. Quinn, A. Rodin, B.B. Skorodumov, R.S. Slepnev, G. Ter-Akopian, W.H. Trzaska, A. Wohr and R. Wolski 977
A multi-reflection time-of-flight mass spectrometer for mass measurements of short-lived nuclei
Y. Ishida, M. Wada and H. Wollnik 983

Exotic Targets

Characterization studies of prototype ISOL targets for the RIA
J.P. Greene, T. Burtseva, J. Neubauer, J.A. Nolen, A.C.C. Villari and I.C. Gomes 986
An inexpensive and fast method for infiltration coating of complex geometry matrices for ISOL production target applications
Y. Kawai, G.D. Alton and J.-C. Bilheux 991
Thermal modeling of the HRIBF targets
Y. Zhang, D.W. Stracener and G.D. Alton 996
Spin polarized solid target as a prospective tool for radioactive ion beam physics
J.P. Urrego-Blanco, B. van den Brandt, E.I. Bunyatova, A. Galindo-Uribarri, P. Hautle and J.A. Konter 1001
Large area isotopic silicon targets for astrophysical reaction rate studies in ^{26}Si
J.P. Greene and G.P.A. Berg 1006
High heat flux accelerator targets cooling with liquid-metal jet impingement
I. Silverman, A. Arenshtam, D. Kijel and A. Nagler 1009

Author index 1014